**3GPP TSG-RAN WG4 Meeting # 104-e R4-22XXXXX**

**Electronic Meeting, 15 – 26 August 2022**

**Agenda item:** 9.4.7

**Source:** Moderator (Apple)

**Title:** Email discussion summary for [104-e][107] NR\_RF\_FR2\_enh2\_Part\_2

**Document for:** Information

# Introduction

* In this email thread, the remaining issues related to UL gap is discussed and include
* 9.4.2 UL gaps for self-calibration and monitoring
* 9.4.5 UL gaps RRM
* 9.4.6.2 UL gap RRM perf

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Qualcomm | CH Park | chparkqc@qti.qualcomm.com |
| Qualcomm | Ville Vintola | [vvintola@qti.qualcomm.com](mailto:vvintola@qti.qualcomm.com) |
| Ericsson | Christian  Venkat | [christian.bergljung@ericsson.com](mailto:christian.bergljung@ericsson.com);  venkatarao.gonuguntla@ericsson.com |
| Sony | Kun Zhao | kun.1.zhao@sony.com |
| vivo | Hao Du  Yanliang SUN | [duhao.txyjy@vivo.com](mailto:duhao.txyjy@vivo.com)  Yanliang.sun@vivo.com |
| ZTE | Chenchen Zhang | zhang.chenchen@zte.com.cn |
| apple | Yang Tang | yang.tang@apple.com |
| Huawei,HiSilicon | Lingyu Kong | konglingyu4@hisilicon.com |
| Nokia | Lars Dalsgaard | lars.dalsgaard@nokia.com |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: RF requirements and related testing

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| [**R4-2211884**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211884.zip) | Maintenance of UL gaps for self-calibration and monitoring | Apple | **Proposal 2: If step 3 is to be defined, implementation margin needs to be added.**  **Proposal 3**: Modified step 3 test procedure as:  Measure the EIRP where the UL duty cycle is configured lower than the maxUplinkDutyCycle-FR2 (or UL duty cycle = [10] % if UE does not report the maxUplinkDutyCycle-FR2) and without the UL gap configured. 🡪 P-bit = 0 for UE report the maxUplinkDutyCycle-FR2 or enhanced EIRP2 (should be at least reference EIRP **+ [1.25]** dB) for UE does not report the maxUplinkDutyCycle-FR2.  - no P-MPR should be applied when the configured UL duty cycle is lower than the UE reported capability maxUplinkDutyCycle-FR2 per Rel-15 agreement.  - For UE does not report maxUplinkDutyCycle-FR2, it is still correct UE behaviour to lower the PMPR with reduced uplink duty cycle. |
| [**R4-2213641**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213641.zip) | UE Tx power management test case for MPE compliance | Sony, Ericsson | **Observation 1: no additional test effort is required for UE does not report the maxUplinkDutyCycle-FR2 for step 3 to verify the PMPR behavior with uplink duty cycle since the measurement results in the MOP test can be re-used. Only one additional peak EIRP measurement at a higher duty cycle is needed.**  **Observation 2; the current wording in Tx power management can be misinterpreted as UE shall always apply PMPR as long as there is no uplink gap, and a clarification is needed.**  **Proposal 1: step 3 of the proposed test procedure (of the WF in R4-2206604) shall be specified; the Ppeak\_EIRP shall be attained a duty cycle lower than [10]% or for a duty cycle lower than the capability maxUplinkDutyCycle-FR2. No P-MPR shall be applied for this case.**  **Proposal 2: It is proposed to revise the text in 38.101-2 as below:**  For UE support UL gap, when UL gap for Tx power management is not configured and activated or the configured uplink duty cycle is lower than the maxUplinkDutyCycle-FR2 (or UL duty cycle = [10] % if UE does not report the maxUplinkDutyCycle-FR2), UE shall set the P bit in PHR to 1 in the test when PHR is configured. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1: on step 3 test procedure

*Related agreement in RAN#103e*

* *Agreement: Step 3 discussion is decoupled with UL gap.*
* *Agreement: When UL gap is not configured/activated and PHR is configured during the test, P bit in PHR shall be 1 during the UL gap test.*

*Open issues and candidate options before e-meeting:*

* R4-2213641(Sony, Ericsson)

**Proposal 1: step 3 of the proposed test procedure (of the WF in R4-2206604) shall be specified; the Ppeak\_EIRP shall be attained a duty cycle lower than [10]% or for a duty cycle lower than the capability maxUplinkDutyCycle-FR2. No P-MPR shall be applied for this case.**

**Proposal 2: It is proposed to revise the text in 38.101-2 as below:**

For UE support UL gap, when UL gap for Tx power management is not configured and activated or the configured uplink duty cycle is lower than the maxUplinkDutyCycle-FR2 (or UL duty cycle = [10] % if UE does not report the maxUplinkDutyCycle-FR2), UE shall set the P bit in PHR to 1 in the test when PHR is configured.

Proposal:

* Option 1: revisit step 3 agreement in RAN4#103 to specify step 3 in UL gap related tests
  + If Yes to option 1, please provide your comments on R4-2213641
* Option 2: keep the agreement in RAN4#103 unchanged
  + Option 2.1: discuss step 3 in this email thread independently from UL gap
    - If Yes to option 2.1, please provide your comments on R4-2211884
  + Option 2.2: stop step 3 related discussion in this email thread and seek for the guidance from chairman on how to proceed

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | We are supportive of this proposal, it is almost zero effort and addition to the test procedures and would clarify the UE behavior. However, it might make sense to us wording “lower or equal to” since the capability description says this value can be used for full power, see below.  ***maxUplinkDutyCycle-FR2***  Indicates the maximum percentage of symbols during 1s that can be scheduled for uplink transmission at the UE maximum transmission power, |
| Ericsson | Option 2.1. This test should make sure that the UE increases the output power to that measured in the power-class test when the UL duty cycle is reduced to a value less than or equal to the reported capability or equal to 10% if the capability is not reported. This would clarify behavior in the field.  Proposal 2 in R4-2213641 is addressing the following  “When UL gap for Tx power management is configured and activated, the reported P-MPRf,c shall be less than 3dB. When UL gap for Tx power management is not configured and activated, UE shall set the P bit in PHR to 1 in the test when PHR is configured.”  it is not obvious whether this applies at the duty cycle Z (as used in the gap test) or for a duty cycle of 10% for which the P-MPR shall be zero and the P-bit not set.  The CR in R4-2212775 proposes an additional requirement that the difference between the power class (measured EIRP at Z = 10%) and the maximum EIRP measured at a tentative Z= 50% should be greater than   * the reported P-MPR (the lower limit of the 3 dB range) at the higher duty cycle Z if MPE reporting is supported and configured * 1 dB (the smallest granularity Pcmax and thus P-MPR reporting in any PHR format) otherwise * 0 dB if the P-bit is zero at the higher duty cycle Z (then power class should be maintained)   for *all* UEs irrespective of gap support. The value Z can be the same as that used for the gap test, then RMCs can be reused (and measurements for UEs supporting gaps). The difference averaged over 4 s like some MPE requirements. |
| Sony | 1. First of all, we would like to clarify that proposal 2 in our contribution (R4-2213641) is not directly related to step 3 but rather a clarification for the test of the UL gap.   However, we apologize that we have some typos in our original proposal 2 that cause misunderstanding. The corrected text proposal for proposal 2 shall be:  **For UE support UL gap, when UL gap for Tx power management is not configured and activated ~~or~~ and the configured uplink duty cycle is ~~lower~~ higher than the maxUplinkDutyCycle-FR2 ~~(or UL duty cycle = [10] % if UE does not report the maxUplinkDutyCycle-FR2)~~, UE shall set the P bit in PHR to 1 in the test when PHR is configured.**  This is just to avoid possible misunderstanding that UE always applies PMPR when there is no uplink gap is active, which is not the correct UE behavior to our understanding.   1. For proposal 1 in our contribution (R4-2213641), this is directly for step 3. We agree with QUALCOMM's comments that this requires almost zero effort on the test. We can refer to the test results from step 1 in the uplink gap test as a reference case, and step 3 is just a MOP test.   We agree with the wording suggestion from QUALCOMM, and we also open to considering the implementation margin as suggested by Apple. |
| vivo | We prefer option 2.2. The step-3 try to verify the P-MPR behavior of UE, and it has nothing to do with UL gap as we discussed in the last meeting. We understand that the behavior may be true for practical UE, but this should be a new topic to be discussed. |
| OPPO | Prefer option 2.2.  And it is clear to the group that in previous meeting it was agreed that this step 3 is not related to UL GAP feature, and decoupled with that. In our view, it means this step 3 should be out of the scope of this FR2 enhancement since it is even not part of WID. In general, we suggest to not pursued of this discussion before it is agreed to be part of one WI.  And some technical comments:  1. It maybe not proper to say all the UE will not use PMPR in the field when UL duty cycle is smaller than 10%, juts because of RMC defined in 101-2 is 10%.  Reason: Usually, in RF test UE will not activate MPE monitoring, and no MPE issue will be seen there. And the RMC UL percentage was defined for the purpose of verifying RF/OTA performance rather than for MPE purpose.  2. In current spec, it doesn't define UE behavior when the scheduled UL duty cycle is smaller than its capabilty, it just says when scheduled UL duty cycle is higher than UE capability, PMPR will used. So if company want to introduce new tests, at least the requirement should be clearly defined in RAN4.  And we would like to recall a little bit about how the values for FR2 maxUplinkdutycyle was defined in Rel-15, the original value was from 10% and even 5% based on evaluation of UE to meet MPE regulation requirements.  However, it was changed raised to 15% in RAN plenary due to concerns of NW vendors on the system performance of too low UL duty cycle.  Therefore, the lowest value of FR2 UL duty cycle capabiltiy is not defined based on real UE MPE performance, and there is no guarantee that UE will not use any PMPR like 0.X dB in FR2 when scheduled duty cycle is lower than UE capabilty especially for 15% case.  3. Regarding when maxUplinkdutycycle is not reported, the UE behavior in current spec is defined as “UE may use PMPR or other means to resolve MPE issue”.  It is clear that in this case how to handle MPE is left to UE implementation. Therefore, for some UE may not even monitor the schedule duty cycle, and reduce the UL duty cycle may not impact the UE Tx power.  4. We agree that for UE which rely on reducing time to meet MPE, when reduce the UL duty cycle the Tx power will be improved. But as commented above, this is not applicable for other UEs and not proper to be defined as new requirement for Rel-15 feature. |
| Samsung | In general, we support to treat this Step 3 as separate issue from UL gap, since even the proponents of this may also think this should be applied to “all UEs”.  On the necessity of such Step 3 requirement, we don’t see the necessity. The P-MPR related UE behavior is not tested in existing conformance test, in which P-MPR is disabled, and why this is introduced for all UE after this R17 UL gap feature is introduced? If for UE even not supporting UL gap, is that means P-MPR related UE behavior shall be tested from now on? Without this kind of test, we see no issue even from LTE stage. |
| Apple | Based on Sony’s updated proposal in GTW, we technically agree with the related contents in the proposal. However, we think such requirements should apply to all UE, including UE which supports or does not support UL gap. In this case, the proposal is not very necessary. The existing requirement does not need to be repeated.  Regarding Step 3, we are OK to introduce a general test case applying to all FR2 UE. In our contribution, we also proposed that implementation margin should be considered in the related test. |
| Huawei,  HiSilicon | Stop step 3 related discussion in this email thread. |
| Nokia | With support option1 with clarification from Sony.  Regarding proposal 1, we understand that the intent is to verify that by allowing the UE to reduce the duty cycle below reported ***maxUplinkDutyCycle-FR2,*** the UE may be able to reduce/avoid MPE P-MPR hence increase its output power. Then step 3 is agreeable.  Currently, the smallest reported duty cycle is 15%:  maxUplinkDutyCycle-FR2 ENUMERATED {n15, n20, n25, n30, n40, n50, n60, n70, n80, n90, n100}  We are ok with the proposal 2 of the contribution R4-2213641 considering the clarification make by Sony above, namely “higher than the maxUplinkDutyCycle-FR2”. |

### CRs/TPs comments collection

*For close-to-finalize Wis and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing Wis, suggest to focus on open issues discussion on 1st round.*

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| --- | --- | --- | --- |
| **CR/TP number** | **title** | **company** | **Comments collection** |
| [**R4-2212531**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212531.zip) | Draft CR to correct ‘Annex G Difference of relative phase and power errors’ for FR2 UL coherent MIMO | **Anritsu Limited** | qualcomm: Change is appreciated  Apple: Content is OK. However, based on the agreement in plenary, should this be treated in TEI 18? |
| [**R4-2212775**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212775.zip) | Amendment of the requirement on TX power management | **Ericsson, Sony** | OPPO: Need wait for the conclusion of sub-topic 1-1. |
| [**R4-2214047**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214047.zip) | Correction CR on UL Gap | Qualcomm Incorporated |  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #2: RRM requirements and the related tests

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Title** | **Company** | **Proposals / Observations** |
| [**R4-2211884**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211884.zip) | Maintenance of UL gaps for self-calibration and monitoring | Apple | **Proposal 1: Confirm X=10ms.** |
| [**R4-2213864**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213864.zip) | Discussion on maintenance of UL gaps for self-calibration and monitoring | ZTE Corporation | **Proposal 1: Similar situation as RACH procedure, in order to finish some RRM procedures in which CSI report is involved in, CSI report can be prioritized over UL gap.** |
| [**R4-2211885**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211885.zip) | RRM performance requirements: UL gaps for self-calibration and monitoring | Apple | **Observation 1: It is up to the UE to determine when to transmit RACH, CG-PUSCH, PUCCH for SR and LRR.**  **Proposal 1: No need to define test cases for UL signal prioritization of RACH, CG-PUSCH, PUCCH for SR and LRR over UL gap.**  **Proposal 2: If prioritization rule for valid CQI report during Scell activation procedure is to be tested, use FR2 intra-cell Scell activation test case as baseline, with additional specification of UL gap configuration offset fully overlapping with the periodic CQI report.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: time period between UL gap and CSI report colliding and MAC CE for Scell activation

*Related agreements in RAN4#103e*

* The valid CSI report and/or valid L1-RSRP report during SCell activation procedure, where the valid CSI report is valid CQI with non-zero CQI index defined in clause 5.2.2.1, TS 38.214 and the valid L1-RSRP report is non lowest L1-RSRP defined in clause 10.1.6.
  + The UE need not apply UL gap prioritization rules specified above for SCell activation procedure if the time period between UL gap colliding with CSI report of non-zero CQI or L1-RSRP and the slot where the SCell activation MAC CE or CSI report activation command is received is less than [X ms].
* Proposals
  + Remove the bracket and define X=10ms

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Support the moderator’s proposal |
| Ericsson | Support the proposal |
| vivo | OK to the proposal |
| ZTE | Fine with the proposal |
| Nokia | Proposal is agreeable. |

### Sub-topic 2-2: Test on prioritized procedure over UL gap

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

* **Proposal 1: No need to define test cases for UL signal prioritization of RACH, CG-PUSCH, PUCCH for SR and LRR over UL gap.**
* **Proposal 2: If prioritization rule for valid CQI report during Scell activation procedure is to be tested, use FR2 intra-cell Scell activation test case as baseline, with additional specification of UL gap configuration offset fully overlapping with the periodic CQI report.**

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| **Company** | **Comments** |
| Qualcomm | Support Proposal 1 and Proposal 2.  Regarding Proposal 2, the test configuration shall be adjusted in such a way that the timing gap from the slot where SCell activation MAC command is received to the first slot to be used for the valid CQI report of to-be-activated Scell shall meet the condition of the prioritization rule, i.e. [X]ms. |
| Ericsson | We agree with both the proposals.  RAN4 can define a test case for testing the prioritization rule of the CQI report during Scell activation. Configuration can be discussed and finalized in the second round. |
| vivo | OK to both proposals |
| Samsung | Support P1.  For P2 for Scell activation procedure, we also see no strong necessity of introducing such test. From RAN1 perspective, there are many prioritization rules also, does that mean all the prioritization rules need to be tested from now on?  If the necessity is based on having concern of bad UE bahavior with no CQI report during Scell activation which leads to the failure of Scell activation, the concern should also be applied to other TX signals which is prioritized over UL gag: e.g., even it is up to UE implementation to transmit PRACH or not for a certain time occasion, but UE anyway should guarantee the PRACH feature if UE is configured with UL gap. If the same logic applies, the group should be worry about all relevant features, which may be impacted by UL gap. |
| Apple | Support both proposals |
| Nokia | Regarding proposal 1, in case of overlap between UL gap and RACH occasion, if the RACH occasion is associated to an SSB index where the UE is not expected to transmit RACH (high path loss, no beam failure event, etc.), then the UE would prioritize the UL gap for MPE monitoring instead of RACH procedure. Else, if the UE is expected to transmit a preamble on the RACH occasion, then UE is prioritizing RACH over MPE monitoring in the UL gap.  Such UE behavior may be clarified though we see no need to test it.  Proposal 2 is agreeable. Agree with Ericsson that the setup can be discussed in 2nd round. |

### Sub-topic 2-3: On other prioritized procedure over UL gap

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Proposal 1: Similar situation as RACH procedure, in order to finish some RRM procedures in which CSI report is involved in, CSI report can be prioritized over UL gap.**

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| **Company** | **Comments** |
| Qualcomm | Please proponent of Proposal 1 provide more specific examples. |
| Ericsson | Do not understand the proposal well. May be proponents please clarify the specific RRM procedures. |
| vivo | Need more clarifications.  Based on proponent’s tdoc, it seems only SCell activation is mentioned. If so, it can be merged into topic 2-1. |
| ZTE | As vivo suggested, this issue can be merged into topic 2-1. And we provide our view in topic 2-1. |
| Nokia | Proposal would need to be clarified. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |  |  |
| --- | --- | --- | --- |
| **CR/TP number** | **Title** | **Company** | **Comments collection** |
| [**R4-2211886**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211886.zip) | DraftCR on UL gaps for BPS | Apple | Ericsson: I think the cover sheet needs to be updated. If Apple did not have a CR number, we can revise our CR. |
| Nokia: Change in CR is agreeable (pending that the group agrees on 10ms). Cover page needs updates as pointed out by Ericsson |
|  |
| [**R4-2213938**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213938.zip) | Draft CR on UL gaps for BPS | Ericsson | Ericsson: I think there is a typo, X should be equal to 10 and not X>=10 |
| Nokia: change in the CR need to reflect the agreement if group agrees on 10ms. Anyway, the CRs can be merged |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents